high mountains, a species of bamboo grew, which, on account of its uniformity and its structure, being neither too hard nor too soft, was exceedingly suitable for a wind instrument. He cut one down and tried it. Tradition says that it gave the same note as his own voice when he was excited by no emotion; and the rippling of the sources of the great Hoang-ho, or Yellow River, which were in the vicinity, followed in the same tone. At the same time the fabulous bird Fung-Hiang, accompanied by his mate, flew to the place. Both perched themselves on a neighbouring branch, and commenced a song, in the course of which each of the birds gave six separate notes. These are the notes which are called the six male and six female tones in the scale discovered by Lyng-lun, and which correspond to the ancient doctrine of the male and female principles in Nature. As a matter of course, the deepest of the male notes was the one already discovered by the philosopher himself. He now endeavoured to reproduce the other notes with the help of bamboo pipes, and succeeded. His task was now to lay down fixed rules as to the length of the pipes, so that thenceforth they could be easily constructed everywhere. For this reason, and also because such a scale of notes depends upon slight differences of length, and there were scarcely at this time instruments to divide great lengths, he necessarily arrived at the notion of passing from the less to the greater, and of laying down an adequately small natural unit for his measurements. That could be nothing else but a grain of seed; and now the point was to get seeds of the greatest possible uniformity. He chose a sort of millet, the *Sorghum rubrum*, the seed of which is of a dark brown colour, and which is said to possess the advantages of greater hardness and uniformity than that of the gray and other kinds. The seed is pointed at the ends, and from one point to the other the length is somewhat greater than in the direction at right angles. Lyng-lun now fixed the length of the pipe, which gave the keynote at 81 grains of the seed placed lengthwise in a row. But when the grains were placed breadthwise it took 100 grains to give the same length. Thus the double division of 9×9 and 10×10 was naturally arrived at. According to the dimension in question, it was called a musical or an ordinary foot, the latter being introduced with the decimal subdivision as a measure of length. The breadth of a grain of seed was 1 *fen* (a line), 10 *fen* = 1 *tsun* (an inch), 10 *tsun* = 1 *che* (a foot), 10 *che* = 1 *chang*, 10 *chang* = 1 *ny*. In subsequent times the line was divided into tenths, hundredths, &c. Lyng-lun also laid down rules for the breadth as well as for the length of the pipe, because, although the note is essentially dependent on the length, it is nevertheless necessary for its purity that the pipe should be neither too broad nor too narrow. He therefore fixed the circumference on the inside at nine grains laid lengthwise. With these dimensions, namely, a length of eighty-one grains, and an internal circumference of nine, the pipe which gives the keynote contains just 1200 grains, and this volume accordingly was made the unit of dry measure, and was called a *yo*; 2 *yo* = 1 *ko*, 1 *ko* = 1 *cheng*, 10 *cheng* = 1 *ten*, 10 *ten* = 1 *hu*. So far we see how the units of length and dry measure were connected with the musical keynote. The twelve notes of the scale are all derived from the keynote, and are to a certain extent comprehended in it. Hence if the 1200 grains contained in the pipe are divided among the twelve notes it gives to each a hundred, and the weight of these hundred grains was made by Lyng-lun the unit of weight. This was divided and subdivided on the decimal system until a single grain became the lowest weight of all. At a later period even the coinage became connected with this system, for one of the weights, the *leang*, corresponding to our ounce, became the weight of metal put into a coin, so that the modern *tael*, in which mercantile quotations are found every day in the *Times*, is merely an ounce of silver, and is thus directly connected with the musical scale. Finally, says Dr. Wagener, it appears from this account that, in China, weights, measures, coinage, and the tuning of musical instruments have been derived quite consistently from a constant unit supplied by Nature herself, and that the essentials of this system are over 4600 years old.

NOTES

THE Queen has been pleased, through His Grace the Duke of Richmond and Gordon, to intimate a subscription of 25*l.* to the Scottish Marine Station for Scientific Research, Granton, Edinburgh.

THE Washington International Prime Meridian Conference discussed at length on Monday a resolution for adopting the Greenwich meridian, which several American and British delegates advocated. M. Janssen, the French delegate, opposed the motion in a long address, arguing in favour of what he called a "neutral" meridian, and suggesting that the prime meridian should run, either through Behring Straits, or one of the Azores. After some further debate the Conference adjourned subject to the call of the chairman. No opposition to the election of Greenwich was shown excepting by France, but doubts are expressed as to whether the Conference will have any result.

ACCORDING to the *Standard's* Calcutta Correspondent, the Commission under the direction of Dr. Klein, appointed by the Indian Government to examine into the cholera question, is satisfied that Dr. Koch's microbe is not the cause of the disease. The Commission is still continuing its inquiries, but so confident is Dr. Klein on the microbe question that he swallowed a number of them without any evil results.

"THE Philadelphia meeting of the American Association," *Science* states, "is credited with being the most successful up to this time. The total attendance was 1249. Great Britain contributed 303; Pennsylvania, 246; New York, 161; Massachusetts, 87; District of Columbia, 84; New Jersey, 58; Ohio, 57; Connecticut, 32; and Virginia, 22. The membership was increased nearly 25 per cent., 515 new members being elected, the number of members up to this meeting being 2033. The number of papers read was larger than ever before, and it is to be hoped that the weeding-out of the trivial matters so often offered was carried to a greater extent than usual. There was a general feeling that there was too much going on. A large portion of the physicists were engaged as examiners at the Electrical Exhibition, and were, of course, interested in the meetings of the Electrical Conference. Somewhat less science, and somewhat more time to enjoy the junketing, would be more in accordance with the desires of many, if one may judge from the opinions expressed on the way home. A proposition to confine the reading of papers to the mornings would have met with many supporters."

IT would seem that the International Scientific Association, which it was proposed at Philadelphia to organise, has been really founded. *Science* informs us that it has now a more assured existence, thanks to the fund of twenty thousand dollars which will be established through the liberality of Mrs. Elizabeth Thompson. Of this fund five thousand dollars have already been paid to the Association, and five thousand more will be paid next year on condition of ten thousand being raised from other sources. The income from this fund is to be devoted to research. Not only did Mrs. Thompson give liberally to this new Society, but she also gave one thousand dollars to the American Association for the Advancement of Science, to be used in researches on light and heat. Mrs. Thompson takes great interest in the recent marvellous advances in the application of electricity, and felt a desire to contribute, as far as lay in

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her power, to the advancement of our knowledge of the forces of Nature. Appreciating the unity of energy, whether displayed as heat or light or electricity, Mrs. Thompson gave the money for researches as to the nature and sources of light and heat, in the hope that more may be learned of the connection which may exist between heat and light and electricity.

PROF. COSSAR EWART has sailed for the United States on a semi-official mission connected with the Fishery Board. He is to make full inquiry into the fishery regulations of the United States, to examine the fish hatcheries there, and otherwise to gather all possible information on the subject upon which he was engaged at home during last winter and spring with so much energy and success.

THE death is announced of Dr. Leopold Fitzinger, formerly custodian of the Zoological Court Cabinet at Vienna.

THE latest news from the Lena Meteorological Station at Sagastyr appeared in the last issue of the St. Petersburg *Izvestia*, dated January 13 and February 14. The small-pox, brought last year from Yakutsk, has made great ravages among the already scarce population of the delta. Nearly all (seventy) Yakuts living at Bouloun have died from the epidemic; and in the three settlements at Cape Bykoff forty persons died from it; even at Kytakh, close to the Meteorological Station, a Yakut who had fled from small-pox died in December last. The staff of the Observatory were quite well in February, and, with their provisions of fresh meat, were not afraid of scurvy. The magnetic storms were not so strong nor so frequent as last winter. The greatest cold witnessed in December was − 48° C., and, on the whole, the winter was far milder than last year. Frosts below − 40° were rare, and temperatures as low as − 52° were not witnessed this winter. The average temperature of February was only − 33°, instead of − 41°, as it was in 1883. On the contrary, strong winds were more frequent than last year.

THE new astronomical Observatory in Hong Kong appears to be now in full working order under Dr. Doberck. We have received its usual monthly weather reports, containing copious observations on the barometric pressure, temperature, temperature of evaporation and radiation, relative humidity and tension of aqueous vapour, duration of sunshine, rainfall, duration and velocity of the wind, &c.,—in all, fifteen tables. The meteorological work, especially when taken in connection with that of the Observatories at Siccawei, Manilla, and Tokio, and the observations at the various Chinese Customs stations and lighthouses must be of great value. For the benefit of shipmasters the Astronomer publishes daily a *China Coast Meteorological Register*, giving a summary of the atmospheric circumstances along the coast of China.

AT the same time as the German Association the German Meteorological Society met at Magdeburg and held a public meeting on September 20. Prof. Neumayer spoke on the development of meteorology and its importance in the life of nations. The following gentlemen were elected honorary members of the Society:—Profs. Buys-Ballot (Utrecht), W. Farrel (Washington), J. Hann (Vienna), G. Mohn (Christiania), A. Mühry (Göttingen), and E. E. Schmid (Jena).

PHYLLOXERA has made its appearance in the Pomological Institute of Proskau (Silesia). It is hoped, however, that the spread of the disease may yet be prevented.

THE Russian University of Kief has elected Profs. Kolbe, Helmholtz, Kirchhoff, Pettenkofer, and Hoppe Seyler as honorary members.

A COMMITTEE has been formed at Lucerne with a view of erecting what is called a "universal column." It is to measure 300 feet in height, and is to contain in its interior relief portraits of all the celebrated men and women of the present era on bronze tablets. Another project of the Committee is the building of a "museum of the nineteenth century," to be dedicated to art, science, inventions, commerce, and industry, and to contain the busts and statues of all distinguished persons in these domains. The cost is estimated at seven to eight million francs (280,000*l.* to 320,000*l.*), and is to be met by subscription, lotteries, &c.

THE old lighthouse erected by Smeaton upon the Eddystone rocks 125 years ago, recently replaced by a new lighthouse, has been re-erected upon the Plymouth Hoe. It was opened on September 24 with appropriate ceremony.

PROFESSORS and teachers of mechanics and mechanical engineering have the greatest difficulty in getting suitable models to illustrate the different machines, and combinations of parts, under discussion in their classes; diagrams go a long way as a means of illustration, but appear sometimes very complicated, more especially when the paths of the moving parts are drawn. Take, for instance, the link motion of the locomotive,—the diagram of the motion showing the relative positions of the different parts, when one of the cranks is placed in eight different positions in its path, is very complicated; when a model is used all this vanishes, the action being very simple, and perfectly plain to the average student. Then again the various arrangements of spur-driving gear, nest-gearing, and similar appliances, are very soon understood when illustrated with a model; with a diagram, or drawn on a blackboard, they look complicated and confusing. Perhaps the best and simplest form of demonstrating mechanics is by means of scale models, saving the teacher many long descriptions, and giving the student at once the best possible opportunity of understanding the construction as well as the motion of the different parts. We have before us an Illustrated Catalogue of Apparatus for Technical Instruction, &c. (manufactured by James Rigg, engineer, Queen Victoria Street), issued to meet the demand for appliances required in the various branches of technical education. The grouping of the several subjects is similar to that adopted by the Science and Art Department, the corresponding number of the Government list of 1883 is given side by side with the catalogue number, and the selection of models is decidedly good. The index includes all the subjects generally taught in technical classes. The models are constructed to secure strength and durability, without unnecessary finish, thus placing before the public a valuable series of models for the advancement of technical education at a moderate cost.

THE Japanese Government nominated Mr. Kikuchi Dairoku to attend the Meridian Congress at Washington. This gentleman is a Cambridge Wrangler, and at present fills the Chair of Mathematics at the Tokio University. It says not a little for the scientific advance of the Japanese that they can find one of themselves qualified to represent them at such a scientific meeting as that now being held at Washington.

WE have received from the Commissioner for Japan to the Health Exhibition a catalogue, with explanatory notes, of the exhibits of the Japanese Education Department now at South Kensington. It is not, we believe, generally known that the Japanese section was intended to have been much larger, and the articles were actually shipped from Japan; but owing to a fire on board the steamer by which they were being conveyed, they were spoiled. The loss was chiefly among the appliances, designs, &c., relating to art education, silk-weaving and embroidery by girls at the industrial schools, and specimens of work in bronze by the deaf-and-dumb. The pamphlet before us is much more than a bare catalogue; it is much more a long series of notes on Japanese education and educational appliances past and present, those dealing with the past being by far the

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more interesting. On p. 27 we notice a curious statement. No. 61 to No. 85, says the catalogue, are works published by the University of Tokio. "As English translations accompany many of them, the visitor will be able to gather at once what they treat of," in other words, it is implied that the works were originally written in Japanese, and were afterwards translated into English. This is wholly incorrect; the works which are spoken of as "translations" are the originals, and were written by European gentlemen (whose names, by the way, are suppressed) in the educational department of Japan. Most of them were noticed at the times of their appearance in our own columns. They are all works of high scientific value, and their publication reflects much credit on the University, but, if any remark were necessary at all, it should have been that the Japanese was the translation, and the English the original, and not as stated in the catalogue. Exhibits 86 to 103 are the theses of the students in chemistry presented on graduation, and here the writer's name is in every case given. These papers are no doubt creditable in their way; still they are only the ordinary work of good students, while the others approach in many cases to the dignity of considerable volumes, and represent much labour and knowledge. Yet here the authors' names are withheld, and they are actually spoken of as translations. The writers were men whose names will long be connected with Japanese educational advancement—Messrs. Morse, Knipping, Korschelt, Ewing, and others—and the Commissioner can hardly have been ashamed to have their names in his catalogue, for all who know anything of Japanese education know how much science in Japan is indebted to the labours of these and others like them. Probably quite unintentionally there is not only the *suppressio veri* but also the *suggestio falsi* in the catalogue under this head.

AT the Working Women's College the opening address for the year to students and friends will be delivered in the Maurice Hall of the College, 7, Fitzroy Street, W., to-morrow (Friday) night at 8 p.m., by Mr. George Macdonald. Those interested in the work of the College are invited to be present.

MESSRS. LONGMANS AND CO. announce the following publications as forthcoming:—"Louis Pasteur, his Life and Labours," by his Son-in-Law; translated from the French by Lady Claud Hamilton. "The Science of Agriculture," by F. J. Lloyd. "Custom and Myth; Studies of Early Usage and Belief," by Andrew Lang, M.A. "A Manual of Telegraphy," by William Williams, Permanent Assistant to the Director-General of Telegraphs in India. "Above the Snow Line: Mountaineering Sketches between 1870 and 1880," by Clinton Dent, Vice-President of the Alpine Club.

WE have to record the death of M. Bourdon, the inventor of the metallic barometer and manometer which are so largely used.

IN the report last week of the paper read by Prof. Ramsay and Mr. Sydney Young before the Chemical Section of the British Association, "On Evaporation and Dissociation" (p. 551), in the sentence "as the dissociation *increases* the curves approach, &c.," "increases" should be "decreases." In Mr. Nicols's letter on "Salmon-Breeding" (September 25, p. 513, col. 1, line 13 from top), *parrs* should be *pairs*.

THE additions to the Zoological Society's Gardens during the past week include a Lesser White-nosed Monkey (*Cercopithecus petaurista* δ) from West Africa, presented by Miss Ethel A. Hutton; a Bonnet Monkey (*Macacus sinicus* ♀) from India, presented by Mr. W. Phillips; two Great Bats (*Vespertilio noctula*), British, presented by Capt. W. St. George Ord; a Horned Lizard (*Phrynosoma cornutum*) from Texas, presented by Mrs. S. Russell; an Erxleben's Monkey (*Cercopithecus erxlebeni* ♀) from West Africa, a Common Marmoset (*Hapale jacchus*), a Black-eared Marmoset (*Hapale penicillata*) from South-East Brazil, a Pig-tailed Monkey (*Macacus nemestrinus* ♀) from Java, two Small Hill-Mynahs (*Gracula religiosa*) from Southern India, a Blue-bearded Jay (*Cyanocorax cyanopogon*) from Para, an Alligator (*Alligator mississippiensis*) from the Mississippi, deposited.

PHYSICAL NOTES

M. GARBE has laid down the two following laws in connection with Lipmann's capillary electrometer:—(1) The capillarity constant of mercury is greatest when the electrical difference at the meniscus is *nil*, and, as a rule, its value is independent of the sign of this difference. (2) The electrical capacity at a constant surface of an electrode plunged in a liquid is purely a function of the electrical difference, independent of the sign of that difference, and is least when that difference is *nil*.

M. BEETZ has made a standard cell which is a modified form of Latimer Clark's mercurous sulphate cell. It consists of a tube in which a compressed cake of mercurous and zincic sulphates is placed; at one end of the cake the zinc pole is placed, and at the other end the mercury pole. On short-circuiting the following results were obtained:—

5 minutes ...	1·440 volts	6 hours ...	1·437 volts
1 hour	1·439 ,,	12 ,, ...	1·434 ,,
4 hours ...	1·439 ,,	48 ,, ...	1·408 ,,

The resistance was 15·700 ohms.

M. DECHARME has made some experiments comparing a drop of water falling on to a surface of glass, which he had covered with a thin layer of minium so as to preserve forms obtained, with a rifle bullet striking a target. He found a striking analogy in the results.

M. FOUSSEREAU has found the specific resistance of distilled water, in the same apparatus, to vary from 118,900 to 712,500 ohms, that is to say, in the ratio of 1 to 6. He accounts for this in three ways: (1) by the solution of the surface of the containing vessel; (2) by the solution of matter from the air; (3) to the effect of the dissolved matter during distillation. On the first point he found that at 15° C. after standing in a glass vessel for forty-eight hours the resistance fell 1/30. At 30° C. the change was more rapid, and at 75° C. the resistance varied, so that he was unable to make any measurements. The solution of gases from the air had only a small effect. On the third point great care was observed. Experiment proved that the addition of 1/1,000,000 of potassium chloride reduced the resistance 1/3; according to M. Bouty, hydrochloric acid is five or six times as powerful. In respect to ice, M. Foussereau found that at the moment of congelation the resistance increased nearly 15,000 times, and continued to increase as the temperature fell. Thus ice at −1° C. has a specific resistance of 4865 megohms, and at −17° C. 53,540 megohms. A sample of ordinary water gave 65 times the conducting power, whilst the ice from it was from 30 to 40 times as conducting.

HERR WARBURG has succeeded in electrolysing glass; the method that he adopted is as follows:—He heated a piece of soda lime glass to about 300° C.—at which temperature it is a conductor—and placed it between mercury electrodes. It was necessary to use from 15 to 30 Bunsen cells for a long period. He then found that at the anode side of the glass he had a layer of silicic acid; this layer very quickly reduces the strength of the current owing to its bad conductivity.

M. DUTER has made some very interesting experiments on magnetic shells. He finds that, if thin disks of steel be placed in the field of a powerful electro-magnet so as to magnetise them through from face to face, when they are removed from the field, they have almost entirely ceased to be magnets; but the faint trace left still showing that the disks were magnetised as shells. Again, M. Duter built up a series of steel disks, either separated by thin paper or cardboard, or placed directly together. This series was then magnetised with the disks in the same position as before: now on removing the whole from the field he found he had a permanent magnet, fairly powerful and regularly magnetised. His next step was to take the magnet to pieces by separating it disk from disk; each disk was then found to have almost ceased to be a magnet, but on placing them together again he found that he still had a permanent magnet, but weaker than before.

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